ESO+ Equipment Technical Specifications

1. GENERAL REQUIREMENTS

(a) **All equipment shall be new.**

(b) All ballasts and luminaires shall be Underwriters Laboratory (UL) rated.

(c) Ballast Warranty: All electronic ballasts shall be warranted against defects in material and workmanship for a minimum of 3 years, except for those ballasts listed under sections 2(a), 2(b), and 2(h) of these specifications. The Lighting Design Lab T8 and T5 fluorescent lamp electronic ballast specifications require that these ballasts be warranted for 5 years. The warranty shall include either a 10-dollar replacement labor allowance or complete replacement including labor by an agent of the manufacturer.

(d) Lamp Warranty: Lamps shall be warranted against defects in material and workmanship for 2 years. The warranty shall provide for replacement lamps.

(e) Compact Fluorescent Light Warranty: CFLs shall be warranted for at least 1 year, or for the manufacturer's stated life of the CFL.

(f) All ballasts shall be capable of starting the lamps at the appropriate ambient (surrounding) temperatures. Examples of such ambient temperatures include indoor heated, indoor non-heated, normal outdoor, and cold climate outdoor.

(g) The electric utility shall ensure that all materials, including polychlorinated biphenyls (PCB) ballasts are disposed of, or recycled, in accordance with current environmental laws.

2. INDIVIDUAL MEASURE REQUIREMENTS

(a) **High Performance T8 Fluorescent Lamps and Electronic Ballasts**

(1) This measure can be installed as part of a retrofit or included as part of a new fixture.

(2) This measure must replace either a T12 fluorescent, T8 de-lamp, incandescent, or mercury vapor lighting.

(3) This measure primarily consists of 4-foot T8 lamps, but may include T8 lamps between 2 feet and 8 feet in length. High performance T5 linear fluorescent lamps may be included as part of this measure if they become commercially available.

(4) The ballast input watts shall be from 15 to 114 watts.

(5) The lamps shall have:

(A) A color rendering index (CRI) equal to or greater than 85;

(B) A lumen maintenance equal to or greater than 94 percent;

(C) A lamp life equal to or greater than 24,000; and

(D) 4-foot fluorescent 32 watt T8 lamps shall have initial output equal to or greater than 3,100 lumens.

(6) The electronic ballasts shall meet the requirements of the Lighting Design Lab's T8 and T5 fluorescent lamp electronic ballast specifications current at the time of ballast installation. These specifications are located on the Lighting Design Lab's web site at:

http://lightingdesignlab.com/commercial/ballastlists.html

(7) Lamp/ballast combinations shall have an efficacy of equal to or greater than 95 Lumens per watt.

Lamp/Ballast Efficacy = (Initial Lamp Lumens × No.

of Lamps × Ballast Factor)/Ballast Input Watts.

(8) Performance shall be documented by either the manufacturer's cut sheet stating initial lamp lumens, lamp lumen maintenance, ballast factor, and ballast input watts, or list the manufacturer's model numbers and performance.

(b) **T8 or T5 Fluorescent Lamps and Standard Electronic Ballast**

(1) This measure can be installed as part of a retrofit or included as part of a new fixture. This measure is to be installed only when the measures described in section 2(a) would not be most appropriate to install at a particular facility.

(2) This measure includes T8 and T5 linear fluorescent lamps, 2 feet to 8 feet in length.

(3) The ballast input watts shall be from 15 to 114 watts.

(4) Lamps shall have:

(A) A CRI equal to or greater than 80;

(B) A Lumen Maintenance equal to or greater than 90 percent;

(C) A Lamp life equal to or greater than 20,000 hours; and

(D) Any 4-foot fluorescent 32 watt T8 lamps shall have initial output equal to or greater than 2,800 lumens.

(5) Ballasts shall meet the requirements of the Lighting Design Lab's T8 and T5 fluorescent lamp electronic ballast specifications current at the time of ballast installation. These specifications are located on the Lighting Design Lab's website at:

http://www.lightingdesignlab.com

(6) Lamp/ballast combinations shall have an Efficacy of equal to or greater than 80 Lumens per watt.

$$\text{Lamp/Ballast Efficacy} = (\text{Initial Lamp Lumens} \times \text{No. of Lamps} \times \text{Ballast Factor})/\text{Ballast Input Watts}.$$

(c) **Hardwired Compact Fluorescent**

(1) This measure includes both hardwired compact fluorescent fixtures and retrofits.

(2) The ballast input watts shall be from 7 to 99 watts.

(3) This measure must replace existing incandescent or mercury vapor lighting.

(4) Any hard-wired retrofits must remove the existing screw-in lamp sockets. Recessed fixtures must include a reflector designed for the new lamp.

(5) Lamps shall have:

(A) A CRI equal to or greater than 80;

(B) A lumen maintenance equal to or greater than 80 percent; and

(C) A lamp life equal to or greater than 10,000 hours.

(6) Ballasts shall have:

(A) A power factor equal to or greater than 90 percent;

(B) A total harmonic distortion (THD) less than or equal to 33 percent;

(C) A Lamp current crest factor of less than or equal to 1.7, Class A sound rated; and

(7) Lamp/ballast combinations shall have a minimum efficacy of 46 lumens per watt for lamps under 30 watts, and 60 lumens per watt for lamps 30 watts or greater.

(d) **Ceramic Metal Halide Luminaire**

Ceramic metal halide is a hard-wired fixture that uses a high intensity discharge (HID) lamp. The ceramic metal halide:

(1) Shall have a ballast input wattage between 20 and 250 watts (nominal);

(2) Must replace existing incandescent lighting or mercury vapor lighting; and

(3) Shall have lamps that have:

(A) A CRI equal to or greater than 80;

(B) A lumen maintenance equal to or greater than 80 percent; and

(C) A maximum color shift over the life of the lamp of less than or equal to 200 degrees Kelvin.

(e) **Screw-in Compact Fluorescent Lamps**

(1) This measure may consist of either:

(A) A one-piece or modular screw-in CFL that is rated at 3 watts or above (nominal); or

(B) Screw-in cold cathode lamps.

(2) The measure must replace existing incandescent or mercury vapor lighting.

(3) The installation of this measure in recessed fixtures is not recommended; however, if done, the lamps in recessed fixtures must include a reflector designed for the lamp.

(4) Screw-in compact fluorescents must bear the ENERGY STAR® label and meet the ENERGY STAR specifications for energy efficiency. These specifications are located on the EPA ENERGY STAR web site at:

http://www.energystar.gov/index.cfm?c=lighting.pr_lighting

Where ENERGY STAR specifications do not apply, substitutions may be allowed with prior approval.

(f) **LED or Cold Cathode Signs**

(1) This measure includes new light-emitting diode (LED) or cold cathode signs.

(2) This measure must be a retrofit or replace existing incandescent or mercury vapor signs.

(3) The new signs must meet the ENERGY STAR specifications for energy efficiency. These specifications are located on the EPA ENERGY STAR website located at:

http://www.energystar.gov/index.cfm?c=lighting.pr_lighting

(4) The input power must be less than 5 watts per face.

(g) **Induction Lamp Luminaire**

(1) This measure shall be new, however, in some cases, high-quality fixtures may be retrofitted. Such fixtures shall be heat tested to ensure that the retrofit configuration is within the manufacturer's required temperature range.

(2) This measure must replace existing incandescent or mercury vapor lighting.

(3) The lamps shall have:

(A) A CRI equal to or greater than 80; and

(B) A lamp life equal to or greater than 80,000 hours.

(h) **High-Output Fluorescent Luminaire**

(1) This measure is a luminaire that may include new T5, T8, or long twin-tube plug-in lamps (PL). The lamps can be either standard or high-output lamps. The luminaire must be either 4-foot or 8-foot in length.

(2) The ballast input watts shall be from 60 to 600.

(3) This measure must replace:

(A) T12 fluorescent/magnetic ballasts;

(B) Mercury vapor;

(C) High pressure sodium;

(D) Probe-start metal halide; or

(E) Incandescent bulbs.

(4) The lamps shall have:

(A) A CRI equal to or greater than 80;

(B) A lumen maintenance equal to or greater than 90 percent; and

(C) A lamp life equal to or greater than 18,000 hours.

(5) The lamp/ballast combination shall have an efficacy of greater than 80 lumens per watt.

(6) Ballasts shall meet the requirements of the Lighting Design Lab's T8 and T5 fluorescent lamp electronic ballast specifications current at the time of ballast installation. These specifications are located on the ESO Plus Lighting Design Lab's web site at:

http://www.lightingdesignlab.com

(i) **Pulse Start Metal Halide Luminaire**

(1) This measure shall be a new luminaire and shall be installed only when it is not feasible to install high output fluorescent luminaires.

(2) The ballast input watts shall be from 300 to 750 watts.

(3) Lamps shall have:

(A) A CRI equal to or greater than 65;

(B) A lumen maintenance equal to or greater than 75 percent; and

(C) A lamp life equal to or greater than 20,000 hours.

(4) The lamp/ballast combination shall have an efficacy equal to or greater than 89 lumens per watt.

(j) **Occupancy Sensors and/or Timers**

(1) This measure includes infrared, ultrasonic, and dual-technology sensors. This measure may be installed on wall, ceiling, or fixture mounts. Timers can also be included as part of this measure. Either the occupancy sensor or the timer can qualify for incentives under this ESO Plus.

(2) The occupancy sensor must be compatible with the controlled lighting equipment.

(3) The infrared sensors shall require an unobstructed view of targeted motion.

(4) All sensors shall be tuned after installation for proper coverage, sensitivity, and time delay.

(5) The timers and the occupancy sensors shall be rated for the controlled wattage.

(6) The timer may be either electronic or mechanical.

(k) **High Output Fluorescent Retrofit**

(1) High output or very high output T12 fluorescent equipment shall be retrofitted with T8 high output lamps and ballasts. This measure does not require a new fixture. The lamps and the ballasts shall be new.

(2) The input watts of the existing luminaire shall be greater than 200 watts.

(3) The Lamps shall have:

(A) A CRI equal to or greater than 80;

(B) A lumen maintenance equal to or greater than 90 percent; and

(C) A lamp life equal to or greater than 18,000 hours at existing conditions.

(4) Lamp/ballast combination shall have an efficacy of greater than 80 Lumens per watt.

(l) **Very High Output Retrofit with T5 Lamps and Ballasts**

(1) Very high output fluorescent lamps (T12) equipment shall be retrofitted with T5 lamps and ballasts. This measure does not require a new fixture. The lamps and the ballasts shall be new. This measure is to be installed only for applications where the lumen output must be equivalent to the lumen output of the existing equipment.

(2) The input watts of the existing fixture shall be greater than 400 watts.

(3) The lamps shall have:

(A) A CRI equal to or greater than 80;

(B) A lumen maintenance equal to or greater than 90 percent; and

(C) A lamp life equal to or greater than 20,000 hours at existing conditions.

(4) The lamp/ballast combination shall have an efficacy of greater than 80 Lumens per watt.